DRAFT

LAR 06319

Olivine-phyric Shergottite

78.6 grams

Figure 1: Processing photo of Larkman Nunatak 06319. Scale and cube are 1 cm.

Introduction

An olivine-phyric shergottite from Mars, found near Larkman Nunatak in 2006 was reported in the Antarctic Newsletter 30, #2, 2007. According to McBride et al. the exterior has 60% dark brown to black fusion crust with a very fine grained wrinkled texture (figures 1 and 2). The fusion crust exhibits a slight sheen. The interior is a gray and black matrix that is fine grained and very hard.

Figure 2: Fusion crust on LAR 06319. from Antarctic Newsletter 30 #2

Petrography

Thin section descriptions have been published by MeCoy et al. (Newsletter), Mittlefehldt and Herrin (2008), Basu Sarbadhikari et al. (2009) and Shafer et al. (2009), but no one gives the mode. Shafer et al. (2009) describe LAR06319 as "an olivine-phyric shergottite consisting of olivine phenocrysts (up to 3 mm) set in a matrix of pyroxene and maskelynite interspersed with minor oxide phases, phosphate phases and shock melt veins. The olivine and pyroxene are highly zoned (figure 4). Maskelynite laths in the matrix are An_{51-37}. Olivine is brownish in color. Chromite, Ti-chromite, apatite, merrillite, troilite, pyrrotite and pyrite are reported (Basu Sarbadhikar et al. (2009).

Basu Sabardhikar et al. (2009) find that there are abundant "melt inclusions" in the olivine and pyroxene cores.

Chemistry

LAR 06319 has MgO = 15.8 wt. % and the REE pattern for LAR06319 is shown to in Basu Sarbadhikari et al. (2009). Walker et al. (2009) have reported data on the highly siderophile element contents.

Radiogenic age dating

Shih et al. (2009) have dated LAR06319 by internal Rb-Sr isochron at 207 ± 14 m.y. with I_{Sr} = 0.722509 ± 69 (figure 5) and by Sm-Nd isochron at 190 ± 29 m.y. (figure 6). Shafer et al. (2009) dated LAR06319 by Lu-Hf isochron 179 ± 29 m.y. (figure 7).

Other Studies

Oxygen isotopes, determined by Z. Sharp were reported in Antarctic Newsletter 30 #2.

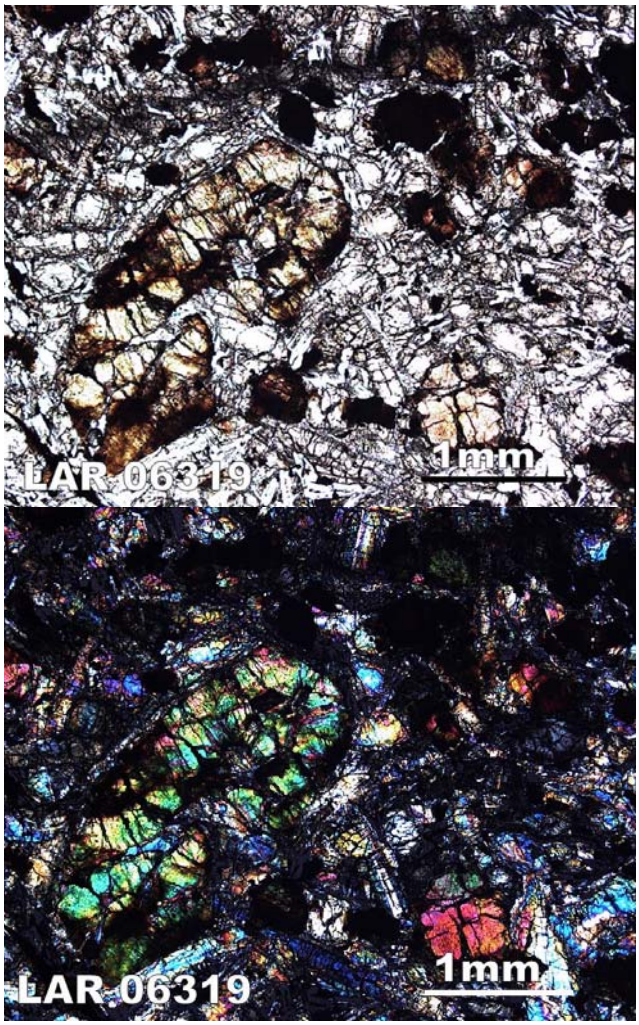

Figure 3: Thin section photos for Antarctic Newsletter. Top is plane polarized ligh; bottom is crossed-polarized.

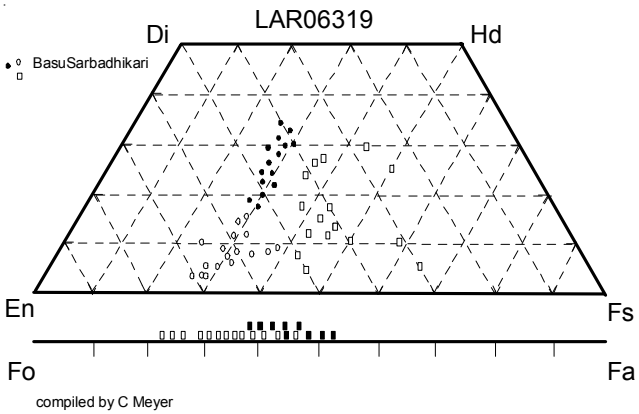

Figure 4: Pyroxene and olivine in LAR 06319 is highly zoned (Basu Sarbadhikari et al. 2009).

References for LAR 06319.

Basu Sarbadhikari A., Liu Y., Day J.M.D. and Taylor L.A. (2009) Olivine-hosted melt inclusions in olivine-phyric Shergottite LAR 06319 (abs#1173). *Lunar Planet. Sci.* **XL**, Lunar Planetary Institute, The Woodlands.

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McBride et al. (2007) Antarctic Newsletter #

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Shafer J.T., Brandon A.D., Lapen T.J., Righter M., Beard B. and Peslier A.H. (2009) Lu-Hf age of Martian meteorites Larkman Nunatek 06319 (abs#1803). *Lunar Planet. Sci.* **XL**, Lunar Planetary Institute, The Woodlands.

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Walker R.J., Putchel I.S., Brandon A.D., Day J.M.D. and Irving A.J. (2009) Re-Os and highly siderophile element systematics of Shergottites : New puzzles regarding the Martian mantle (abs#1263). *Lunar Planet. Sci.* **XL**, Lunar Planetary Institute, The Woodlands.

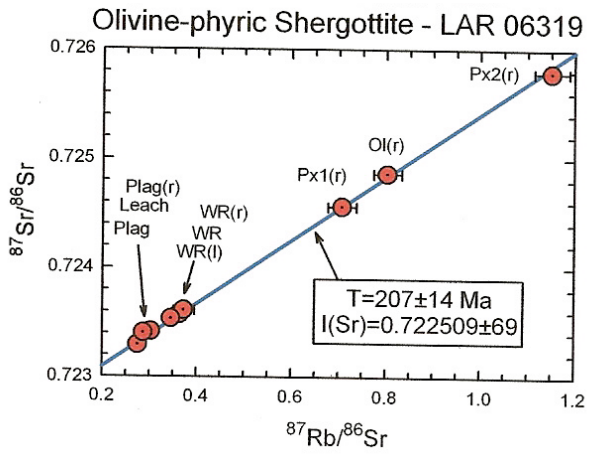

Figure 5: Rb-Sr isochron for LAR 06319 (from Shih et al. 2009).

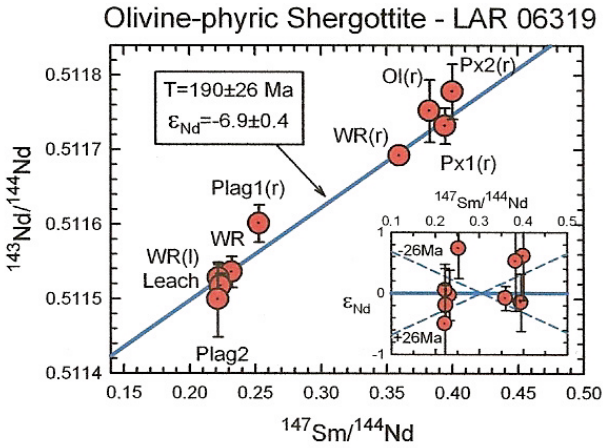

Figure 6: Sm-Nd isochron for LAR 06319 (from Shih et al. 2009).

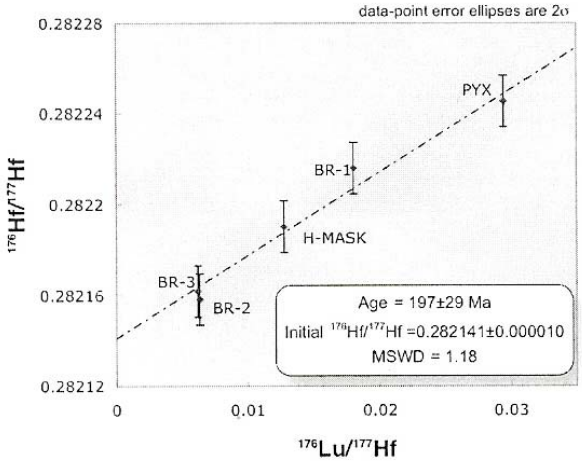

Figure 7: Lu-Hf isochron for LAR 06319 (from Shafer et al. 2009).

Summary of Age Data for LAR06319

	Rb-Sr	Sm-Nd	Lu-Hf
Shih et al. 2009	207 ± 14 m.y.	190 ± 26	
Shafer et al. 2009			197 ± 29